

Guide for
Architects - Engineers

Cost Engineering

Vol 2

TABLE OF CONTENTS

	Pages
Military Estimates	1
Civil Estimates	4
EXHIBIT A	SAMPLE-CODE C ESTIMATE
EXHIBIT B	SAMPLE-CIVIL ESTIMATE
EXHIBIT C	SAMPLE-CODE B ENG FORM 3086
EXHIBIT D	SAMPLE-CODE B AF FORM 1178
EXHIBIT E	SAMPLE-QUANTITY TAKE OFF
EXHIBIT F	SAMPLE-TELEPHONE QUOTATION
EXHIBIT G	CHECK LIST
EXHIBIT H	COMPUTER FORMAT
FORM PACKET	
M-CACES SUPPLEMENT	

INTRODUCTION

1. Cost estimating or cost engineering in the Corps of Engineers is now in a critical transition. The need for accurate, well documented, estimates based on adequate engineering is of the highest priority in both civil and military cost engineering.
2. A major change in the formation of both civil and military estimates involves the use of the Micro-Computer Aided Cost Estimating System (M-CACES). A user guide is included as a supplement to this portion, (volume 23, of the A-E guide. The heart of any cost estimating system is the data base. The M-CACES data base, will in the future, cover more standard civil works type construction. The data Base, however, is not meant to replace the cost engineer's judgment and must be used by an experienced estimator to develop a meaningful document. All major cost engineering efforts will use M-CACES. Specific instructions on the use of software will be through private schools or where appropriate, through Seattle District, Cost Engineering Branch.
3. Another major change is the use of Code of Accounts and line item contingencies in civil works estimates. A sample summary format is shown as exhibit I. Specific guidance on the applications of Code of Accounts and contingency assignment will be accomplished on a case-by-case basis. Line item contingencies will provide the cost engineer a method to better define the risk and help in development of an accurate cost estimate.
4. The major portion of volume 2 remains unchanged because the fundamentals of cost engineering still apply in cases where small civil and military projects require an estimate. Cost engineering in the Corps of Engineers is still evolving and it is expected that this guide will continue to evolve. In summary, costs will control final designs.

1. Military Estimates.

1.1 Basic Types. The various types of military estimates known as current working estimates (CWE) are listed below.

- a. Code A - Less than concept design completed (10 percent of total design or less), and funding documents.
- b. Code B - Concept design completed.
- c. Code C - Final design completed.

CWE' s contain the direct construction costs (at current price level), including contractor' s overhead and profit plus costs pertaining to contingency, supervision and administration, and escalation to anticipated midpoint of construction.

The A-F shall estimate only the direct construction costs (including overhead and profit) based on the current price level. The price level shall be clearly indicated on the estimate. The additional items of cost to arrive at a CWE will be added by the Seattle District Cost Engineering Section. The estimate shall be manually math checked and initialed by both the estimator and checker. NPS Form 92-A or computer spread sheet program Lotus 1-2-3 shall be used exclusively for all estimates (see exhibit H for required computer format). The following guidelines are based on TM 5-800-2 "Preparation of Estimates-Military construction. A checklist as shown as exhibit G shall be submitted with each Code B and Code G submittals.

1.2 Code A Estimates. In cases of funding documents or where no design has been accomplished, the estimate will be based on AR 415-17 for the Army and the Air Force Pricing Guide for the Air Force. AR 415-17 and the Air Force Pricing Guide contains unit prices based on experience throughout military construction size adjustment factors, location adjustment factors, escalation factors, and technological updating factors. Where some design has been accomplished, the estimate will be prepared to the level of detail that the design will allow. Code A estimates are prepared on Forms 3086 (Army) or 1178 (Air Force) as shown on exhibits C and D.

1.3 Code B Estimates. The concept estimate is used to determine the adequacy of the previous current working estimate (Code A) and to ensure that the planned design does not exceed the project funding. The estimate shall be as accurate as possible using all data available at the time of its preparation. The estimate shall be summarized by: (1) each building, including all construction costs within the 5-foot line, and (2) supporting facilities outside the 5-foot line from the exterior walls which include:

- a. electrical service distribution system;
- b. water supply distribution system;
- c. gas supply and distribution system;
- d. sanitary collection and disposal sewage system;
- e. stream distribution system;

- f. roads, streets, parking areas, and shoulders;
- g. walks;
- h. curbs and gutters;
- i. fencing;
- j. storm drainage;
- k. unusual foundations for the primary facility in a above, such as drilled piers, piles, mat foundation, or spread footing;
- l. site improvements such as borrow, cut and fill material, rough grade, fine grade, topsoil, seeding, and landscaping;
- m. demolition; and
- n. communications system

A detailed estimate shall be developed for each facility or system in the estimate summary. The detailed estimate shall be a breakdown of all items of work required to construct the facility or system. The format shall be similar to that shown in exhibit A or exhibit H. The unit price for each item of work shall be broken into labor and materials. Equipment costs may be included in each item or at the end of the estimate at the A-E's option. where there 16 significant equipment hours, the equipment cost will show number of work hours with an appropriate operating rate as obtained from EP 1110-1-8 Construction Ownership and Operating Expense Schedules. Operator cost will be shown separately. The unit prices shall be exclusive of overhead and profit. The price for labor shall be the basic cost of labor plus fringe benefits including travel pay, overtime, insurance, and taxes. Labor wage rates shall be developed using applicable union labor agreements and on the NPS form (provided in form packet). The A-E shall estimate the number of man-hours required for each item of work and apply the cost per man-hour to the total man-hours required for each facility or system. The unit price for materials shall be current catalog prices or prices quoted from a supplier and will be documented similar to exhibit F. Items of work which are normally subcontracted shall be estimated as stated above plus an allowance (percentage) for subcontractor overhead and profit. The subcontractor total will then be included in the direct cost to the prime contractor. Costs for labor, materials, equipment, and subcontractor items shall be individually totaled and then added together for each facility or system. Allowances (percentages) for prime contractor overhead and profit shall be added to arrive at a total facility or system cost. The percentage of overhead and profit for both subcontractor and prime contractor will be discussed with the District Cost Engineering Section. All sales tax as appropriate for the state will be added to the estimate.

The quantities used in the estimate shall be supported by a backup showing computations. The backup shall be clear, organized, summarized, and indexed. The backup shall show computations of lengths, areas, volumes, weights, and numbers of items. The quantities shall be related to the drawings by sheet number. Quantities

shall be neat line, plus sufficient contingencies to cover anticipated final design quantities. A sample of a quantity takeoff is attached as exhibit E. The key to a good quantity takeoff is organization and to have a system where the quantities can be verified or revised quickly.

Computations for waste or loss shall be allowed for by adjusting neat line quantities where applicable. All computations shall be checked and initialed by both the originator and the checker.

All backup supporting the cost estimate shall be submitted with each estimate, including a floppy disk (5-1/4 inches) of all applicable data submitted on computer spread sheet Lotus 1-2-3.

The estimate shall also be summarized on the Form 3086 (Army) or 1178 (Air Force) for all MILCON (Military Construction) projects.

1.4 Code C Estimates. Code C estimates are used to develop the final Government Estimate and will be used to evaluate bids, assist in negotiations, and serve as a guide in establishing a schedule of payments. Code C estimates are based upon final design plans and specifications. Code C estimates shall be prepared in the same manner as Code B estimates, except as follows:

a. The detail of the estimate must reflect the level of detail in the design.

b. Quantities shall be neat line, without contingencies. Quantities for waste or 1088 shall be estimated by adjusting the neatline quantities carefully and only where waste is clearly justified. Significant waste factors shall be shown and justified. Allowances for compaction or swell shall be included and clearly identified.

c. The estimate shall be summarized to reflect the bid schedule.

d. The prime contractor's overhead shall be estimated separately (in lieu of using a percentage) and the overhead and profit shown as separate items on the summary sheet. These items must be realistic to reflect conditions as stated in the bid documents. Overhead over direct percentage should be computed in order to verify that it is reasonable, i.e., overhead and profit of 30 percent for routine building is not reasonable.

2.2.1 Current Estimates. Current estimates are prepared at each stage of design and are used for project justification, project authorization, comparison of alternatives, funding, and negotiations. Current estimates shall be prepared as described in EM 1110-2-1301, "Cost Estimates - Planning and Design Stages."

2.2.2 Reasonable Contract Estimate. This estimate is prepared after plans and specifications are complete. This estimate is used for bid evaluation and to assist in negotiations. Estimates (except for "Building Construction") shall be prepared as described in EM 1110-2-1302, "Government Estimate of Fair and Reasonable Cost to Contractor," with the following exceptions:

a. The exception noted in paragraph 2-3a and as stated in paragraph 2-3c will not apply.

- b. Paragraph 3-2. The Seattle District Estimating Section will prepare this portion of the estimate.
- c. Paragraphs 3-3f, 3-3h, 3-3i, 3-3j, and 3-3k will not apply.
- d. Paragraphs 3-5c and 3-5e will not apply.
- e. Paragraph 8-9, Distribution of Overhead, should be estimated and summarized only. Distribution to the contract payment items on ENG Form 1739 is not required.

2.3 Quantities. The quantity takeoff and backup shall be prepared as stated under paragraph "MILITARY ESTIMATES" and included under "Supporting Data," as described in paragraph 3-4 of EM 1110-2-1302.

3. SECURITY. Construction cost estimates shall be handled as confidential information. They shall be kept in a locked safe when not in use with access limited to those persons working on the estimates. All Code C and reasonable contract estimates shall be marked "FOR OFFICIAL USE ONLY" at the bottom of each sheet. All material marked "FOR OFFICIAL USE ONLY" shall be returned to the contracting officer. All employees shall be indoctrinated in the above security regulations. And request from the public or other Government offices for information regarding cost estimates shall be referred to the contracting officer.

4. CHECKLIST. A checklist is shown as exhibit G which will be required to be submitted with each estimate. This checklist is used to serve as a tool for assuring a quality product.

5. FORM PACKET. A form packet is attached for use as masters for reproducing the required number of forms for both Military and Civil Works Estimates.

2. Civil Estimates.

2.1 Basic Types. Civil construction can be classed as either Building Construction or Heavy and Highway Construction. For project classed as "Building Construction," the estimates shall be prepared as described for Military Code B and Code C estimates. See exhibit B for a sample Civil Estimate.

2.2 Heavy and Highway Construction. heavy and highway construction estimates can be classed as either "Current Estimate" or "Reasonable Contract Estimate".

2.2.1 Current Estimates. Current estimates are prepared at each stage of design and are used for project justification, project authorization, comparison of alternatives, funding, and negotiations. Current estimates shall be prepared as described in EM 1110-2-1301, "Cost Estimates - Planning and Design Stages."

2.2.2 Reasonable Contract Estimate. This estimate is prepared after plans and specifications are complete. This estimate is used for bid evaluation and to assist in negotiations. Estimates (except for "Building Construction" shall be prepared as described in EM 1110-2-1302, "Government Estimate of Fair and Reasonable Cost to Contractor," with the following exceptions:

- a. The exception noted in paragraph 2-3a and as stated in paragraph 2-3c will not apply.
- b. Paragraph 3-2. The Seattle District Cost Engineering Section will prepare this portion of the estimate.
- c. Paragraphs 3-3f, 3-3h, 3-3i, 3-3j, and 3-3k will not apply.
- d. Paragraphs 3-5c and 3-5e will not apply.
- e. Paragraph 8-9, Distribution of Overhead, should be estimated and summarized only. Distribution to the contract payment items on ENG Form 1739 is not required.

2.3 Quantities. The quantity takeoff and backup shall be prepared as stated under paragraph "MILITARY ESTIMATES" and included under "Supporting Data," as described in paragraph 3-4 of EM 1110-2-1302.

3. Security. Construction cost estimates shall be handled as confidential information. They shall be kept in a locked safe when not in use with access limited to those persons working on the estimates. All Code C and reasonable contract estimates shall be marked "FOR OFFICIAL USE ONLY" at the bottom of each sheet. All material marked "FOR OFFICIAL USE ONLY" shall be returned to the contracting officer. All employees shall be indoctrinated in the above security regulations. Any request from the public or other Government offices for information regarding cost estimates shall be referred to the contracting officer.

4. Checklist. A checklist is shown as exhibit G which will be required to be submitted with each estimate. This checklist is used to serve as a tool for assuring a quality product.

5. Form Packet. A form packet is attached for use as masters for reproducing the required number of forms for both Military and Civil Works Estimates.

6. Field Visits. Field visits shall be conducted by A-E cost engineers to review estimates to assure complete scope and accurate pricing. This section may be waived where justified. Where field visits are conducted, a trip report shall be made part of supporting data.